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New System for Highly Sensitive Magnetic and Radon Monitoring of the Active Fault in the Dead Sea Rift Region

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The relation between seismic activity and anomalous behavior of the geomagnetic field was the subject of investigation during the last decades. However, seismically related changes in the behavior of the Earth's magnetic field are very often overlapped by diurnal variations of ionosphere and magnetosphere origin and sometimes by artificial field disturbance typical for densely populated regions.

The solution of origin discrimination problem can be found by taking into account the difference in distance between observation point and field sources. Such difference brings the opportunity for distinction of the source location on the base of field spatial structure analysis. Development of new super-sensitive magnetometer based on the principle of optical pumping in potassium vapors brings an opportunity for short-base gradiometer measurements with sub-pT resolution. Application of such a technique permits to suppress significantly the external variations and thus gives good grounds to filter out magnetic field changes of seismic origin.



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Radon anomalies along the western shore of the Dead Sea were the subject of investigations carried out from 1990. The results obtained show that correlation of Rn events with earthquakes in the nearby sectors of the Rift exceeds significantly the value expected for randomness. Moreover, the correlation improves for earthquake magnitudes > 2 and > 3 in the nearby sectors of the Rift. The establishment of this link between Rn events and earthquakes in a specific region is a contribution to the notion of using Rn monitoring as an earthquake precursor.

We expect results of joint monitoring of geochemical (Rn) and geomagnetic parameters in the test site, analyzed together with the regional seismic data will enable us to obtain higher correlation between earthquakes and precursor phenomena. To this end we intend to carry out long-term simultaneous measurements of Earth's magnetic field gradient (difference) and Rn emanation in the North-Western part of the Dead Sea Rift transform. Such combined radon and geomagnetic measurements have not been conducted so far. Integration of Rn stations and super-sensitive magnetic gradiometers into multichannel system for geophysical monitoring of active faults represents extremely attractive complementary approach to the problem of earthquake prediction.